



Appl. No.: 10/672,442  
Applicant(s): ALADAHALLI, Chandankumar et al.  
Filed: 26 September 2003  
Title: Sensitivity Based Pattern Search Algorithm for Component Layout  
Art Unit: 2129  
Examiner: HIRL, Joseph P.  
Docket No.: PAT000955-000

**DECLARATION OF DR. CHANDANKUMAR ALADAHALLI**

I, Chandankumar Aladahalli, declare as follows:

1. I have an undergraduate degree in Mechanical Engineering from Indian Institute of Technology, Madras awarded in 1999. I have a Masters Degree in Mechanical Engineering from Carnegie Mellon University awarded in 2001. I have a Ph.D. in Mechanical Engineering from Carnegie Mellon University awarded in 2004.
2. I am an author or co-author on a number of publications including: Aladahalli, C., J. Cagan, and K. Shimada, "*An Efficient Schedule for Patterns in Pattern Search – Theoretical Framework Inspired by 3D Component Layout*," ASME Journal of Mechanical Design, Vol 129, March 2007; Aladahalli, C., J. Cagan, and K. Shimada, "*An Efficient Schedule for Patterns in Pattern Search – An Implementation for 3D Component Layout*," ASME Journal of Mechanical Design, Vol 129, March 2007; Chandankumar Aladahalli, "*Improved Pattern Search Algorithm Using an Objective Function Effect Based Move Schedule for 3D Component Layout*", PhD Thesis, Carnegie Mellon University, November 2004; Aladahalli, C., J. Cagan, and K. Shimada, "*Objective Function-Based Pattern Search – A Computationally Efficient Algorithm for 3D Component Layout*," ASME DETC Design Automation Conference, 2004; Aladahalli, C., J. Cagan, and K. Shimada, "*Minimum Height Packing for Layered Manufacturing Using an Extended Pattern Search Algorithm*," ASME DETC Design Automation Conference, 2003; and Aladahalli, C., J. Cagan, and K. Shimada, "*A Sensitivity-Based Pattern Search Algorithm for 3D Component Layout*," ASME DETC Design Automation Conference, 2002.
3. I am currently a Lead Scientist at, and one of the co-founders of, Design Advance Systems, Inc., the assignee of the '442 application.
4. I am one of the named inventors on U.S. Application Serial No. 10/672,442 ("the '442 application"). I have read and am familiar with the subject matter of the '442 application.

5. The '442 application is directed to pattern-based search techniques. [0002]<sup>1</sup> Pattern-based searches use move sets (patterns) to explore the search space. [0017] For example, moving two steps in the x-direction and one step in the y-direction is a possible pattern in 2D component layout. The magnitude of the steps is controlled by the step size control parameter. [0019]

6. In the initial stages of the search, the step sizes are large so that the algorithm can reach any point in the search space. As the algorithm proceeds, the step size is decreased until a threshold step size is reached after which the algorithm terminates. At a given step size, a trial move is attempted along a pattern direction. Any step that leads to a better state is accepted and a trial move is attempted again and so on. Only when all attempts to make a successful move at a step size have failed, is the step size reduced. [0020]

7. I have read and am familiar with the subject matter of U.S. Patent No. 6,636,862 to Lundahl et al. entitled Method and System for the Dynamic Analysis of Data ("Lundahl").

8. Lundahl is directed to a method and system for the dynamic analysis of data represented in distinct matrices. If two data matrices X and Y are present in which corresponding rows of X and Y each refer to the same underlying object, a relationship can be developed between the X and Y data matrices, which allows for a prediction of responses in Y on the basis of inputted X-data. If a third data matrix Z is present in which corresponding columns of Y and rows of Z each refer to the same underlying object, a relationship can be developed between the X, Y, and Z data matrices. [Lundahl, Abstract]

9. Lundahl has nothing to do with pattern-based searching, as that phrase is used in the '442 application and as explained above in paragraphs 5 and 6.

10. I have reviewed the final Office action dated 21 November 2006 which was issued in connection with the '442 application. In the final Office action, the examiner states on page 4, with reference to independent claims 1 and 23, that:

Lundahl anticipates a method for solving packing and component problems by performing a pattern based search, characterized by driving the search with a metric other than step size (**Lundahl**, c 38:19 – 54 . . . packing and component problems merely represents data for analysis;  $f_x$  is a metric; see Lundahl @ c42: 20 – 32 re networked personal computer.) (emphasis in original)

11. The examiner's statement reproduced in paragraph 10 is incorrect because Lundahl, at column 38, lines 19 – 54, does not disclose a method for solving packing and component layout problems. The examiner's statement is further incorrect because Lundahl, at column 38, lines 19 – 54, does not describe performing a pattern-based search. Lundahl, at column 38, lines 19 – 54 describes the

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<sup>1</sup> References are to the published version of the '442 application, which was published under publication no. 2004/0123253.

general problem where the goal is to find the minimum of a given objective function. The cited portion of Lundahl says nothing about the solution to the problem other than the suggestion to use a third-party (Mathworks) routine called SIMPS. The cited portion says nothing about how to solve packing and component layout problems. The cited portion says nothing about what metric is used to drive the search.

12. The examiner further states in the statement reproduced in paragraph 10 that  $f_x$  is a metric. That is incorrect.  $f_x$  is not a metric and Lundahl does not use the expression  $f_x$  as a metric. The complete expression is  $f_x: z \rightarrow y$ .  $f_x$  is a function indicating that if the x variables are held fixed, then some function of the x variables explains the mapping between z and y.

13. In summary, Lundahl at column 38, lines 19 – 54, does not disclose a pattern-based search, does not disclose a method of solving anything beyond suggesting the use of a third-party routine, and does not disclose a method of solving packing and component layout problems.

14. The examiner's citation to column 42 of Lundahl, lines 20 – 32, mentions networked personal computers. That portion of Lundahl has no impact on the summary set forth in paragraph 13.

15. In the final Office action the examiner states on page 5, with reference to independent claims 4 and 26, that:

Lundahl anticipates determining the effect of a plurality of moves on a set of components (**Lundahl**, c 38: 19 – 54; EN: component moves are those characteristics that make up the objective function); and performing a pattern based search based on said determining (**Lundahl**, c 38: 19 – 54; EN: component moves are those characteristics that make up the objective function). (emphasis in original)

16. The examiner's statement reproduced in paragraph 15 is incorrect because Lundahl does not disclose "moves," Lundahl does not disclose "a set of components," and therefore, Lundahl cannot disclose the "effect of a plurality of moves on a set of components." The examiner's statement that "component moves are those characteristics that make up the objective function" makes no sense in the context of the cited portion of Lundahl, because the cited portion of Lundahl does not disclose "components" or "moves" for components.

17. In the final Office action the examiner states on page 6, with reference to independent claim 43, that:

Lundahl anticipates determining includes deriving [sic] a function that relates moves to changes in an objective function (**Lundahl**, c 38:19-32; EN: moves are synonymous with changes to the objective function). (emphasis in original)

In the final Office action, the examiner similarly states on page 7, with reference to independent claim 21, that:

Lundahl anticipates deriving a function that relates moves to changes in an objective function (**Lundahl**, c 38:19-32). (emphasis in original)


18. The examiner's statements reproduced in paragraph 17 are incorrect because Lundahl does not disclose "moves." Because Lundahl does not disclose "moves," it is not possible for Lundahl to disclose "driving a function that relates moves to changes in an objective function." The examiner's statement that "moves are synonymous with changes to the objective function" is incorrect. "Moves," as that term is used in the pattern-based search field, may or may not result in changes to the objective function. They are not, however, synonymous with changes to the objective function.

19. In the final Office action, the examiner states on page 6, with reference to independent claims 11, 16, 33, and 38, that:

Lundahl anticipates ranking each of a plurality of moves on a set of components based on the effect each move has on an objective function; and ordering the moves from those moves having the highest ranking to those moves having the lowest ranking (**Lundahl**, c 32:5-22). (emphasis in original)

20. The examiner's statement reproduced in paragraph 19 is incorrect because Lundahl does not disclose "moves." The examiner's statement in paragraph 19 is incorrect because Lundahl does not disclose "a set of components." Therefore, it is impossible for Lundahl to disclose "ranking each of the plurality of moves on a set of components based on the effect each move has on an objective function." Furthermore, Lundahl does not disclose "ordering the moves from those moves having the highest ranking to those moves having the lowest ranking."

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

  
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Dr. Chandankumar Aladahalli

09/FEB/2007  
Date